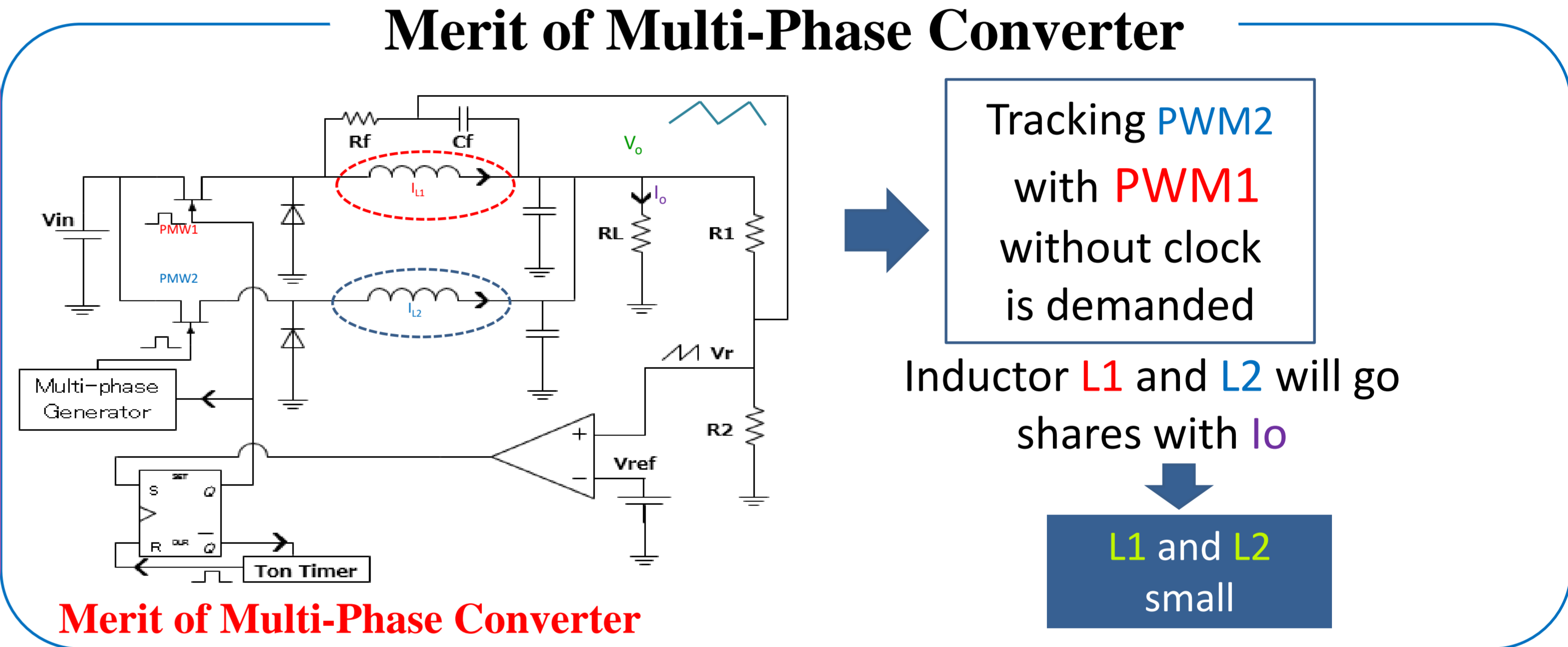
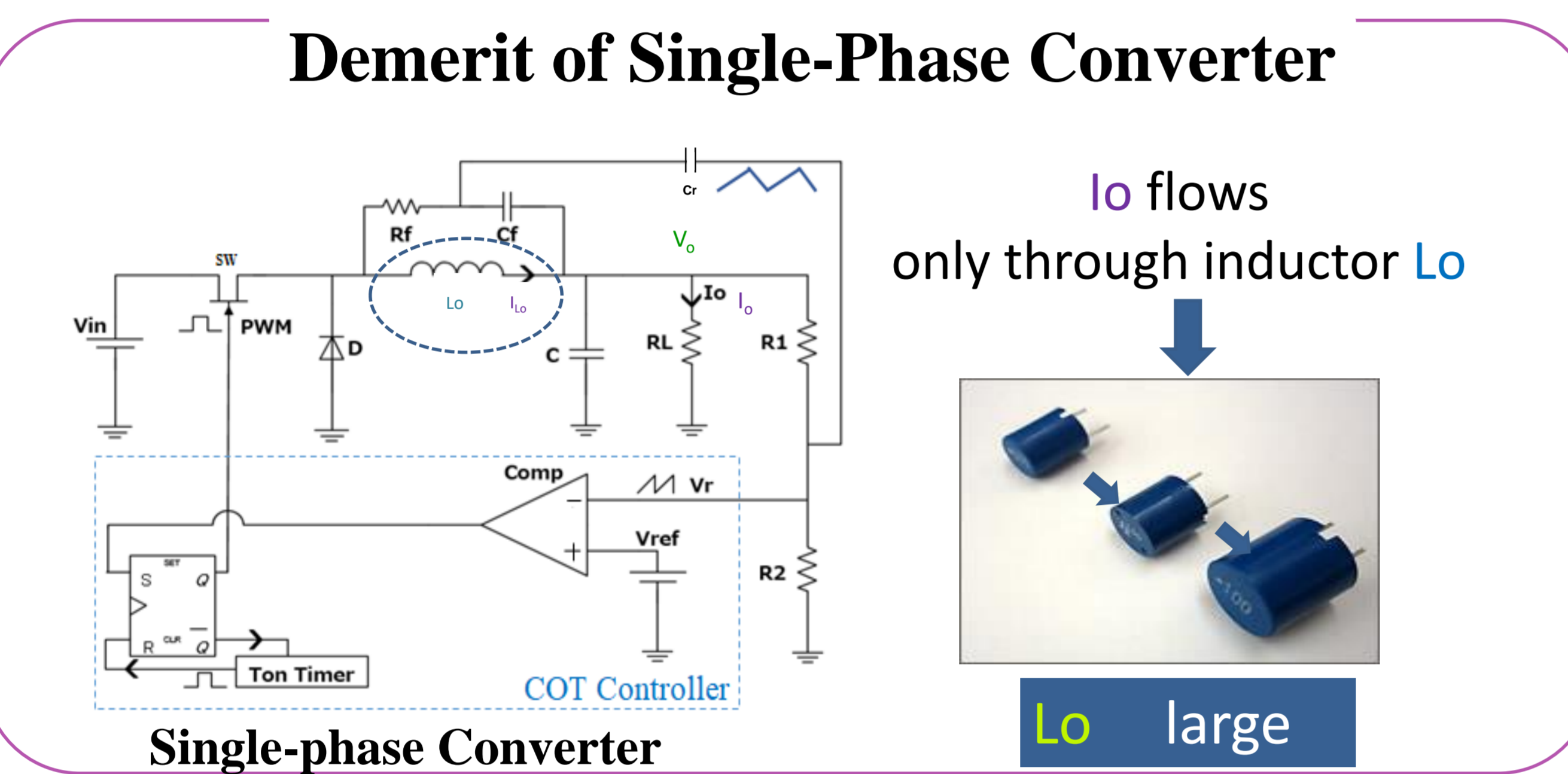
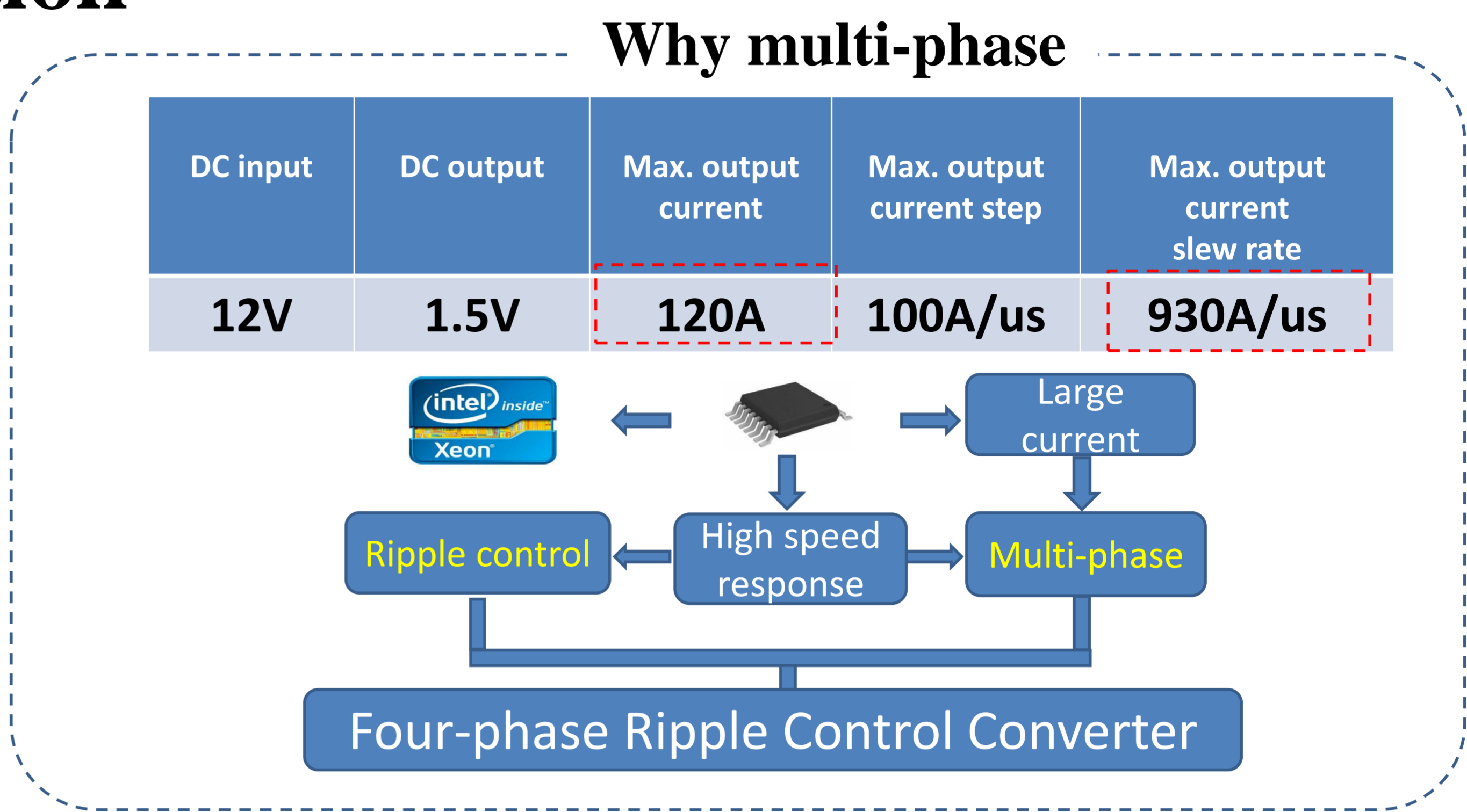
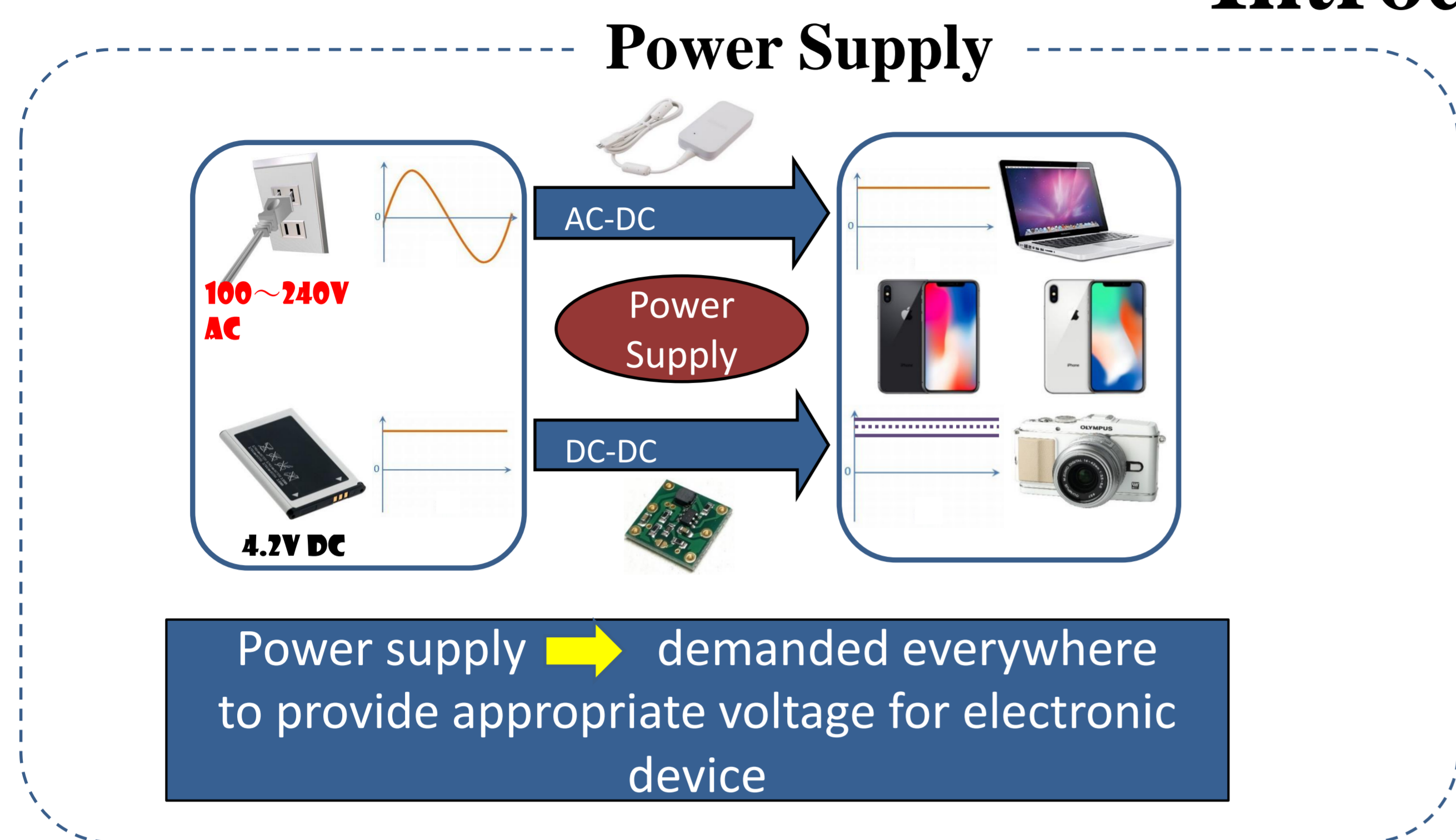


# Multi-Phase Clock-less Switching Converter with EMI Noise Reduction

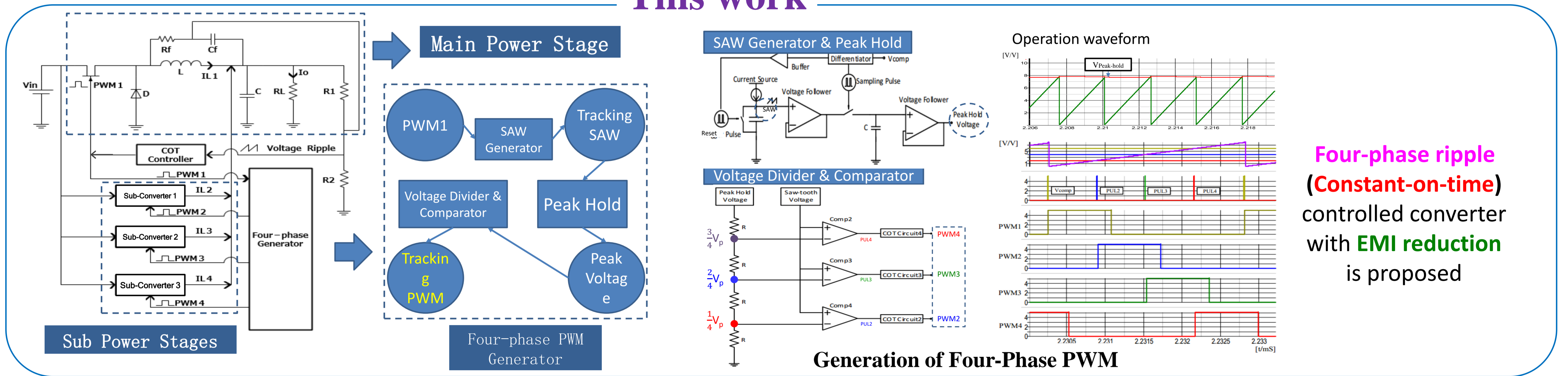
Jing Li, Yi Xiong, Yifei Sun, Tran Minh Tri  
Yasunori Kobori and Haruo Kobayashi

Division of Electronics and Informatics, Gunma University

## Introduction

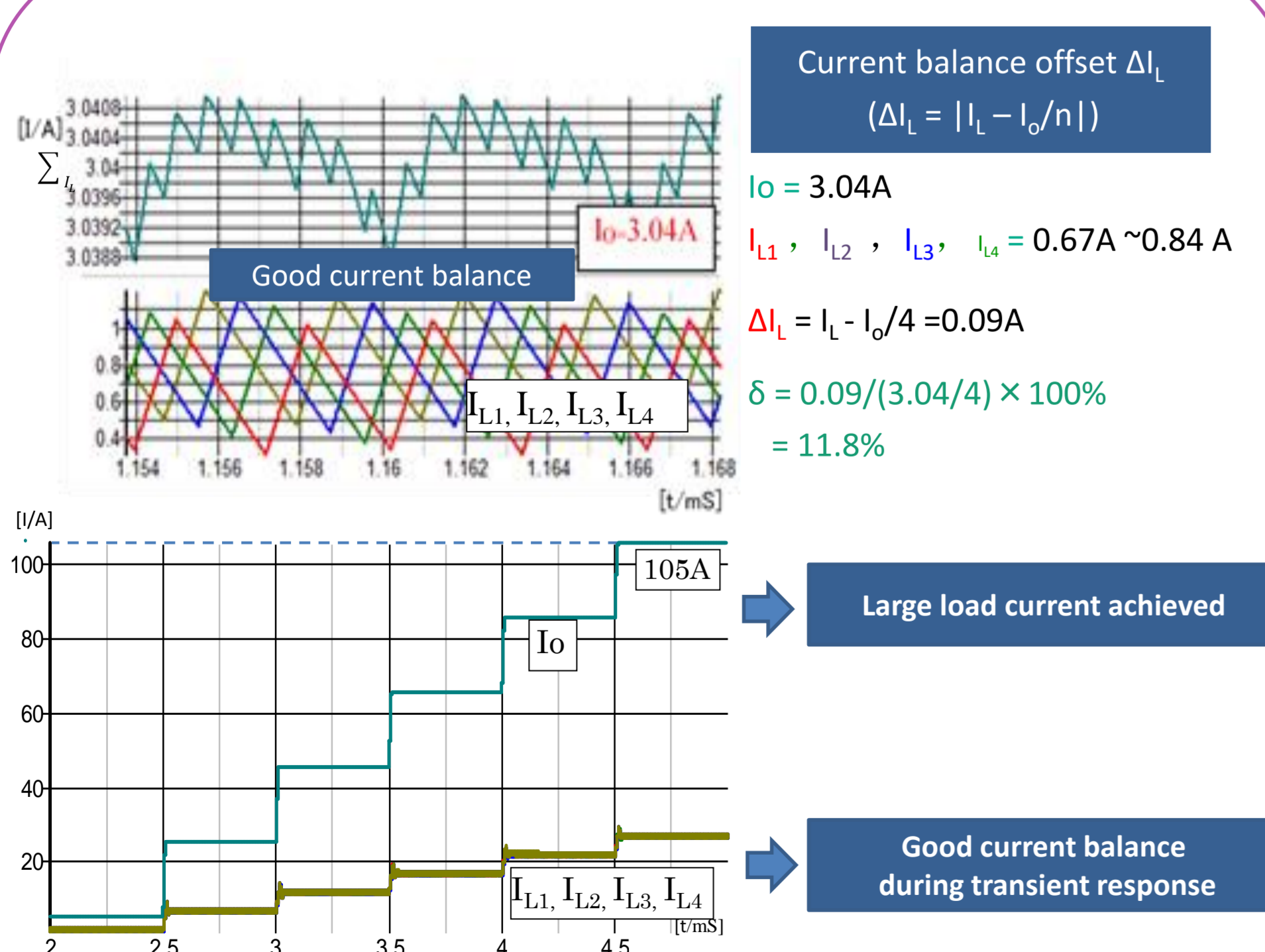


## This work

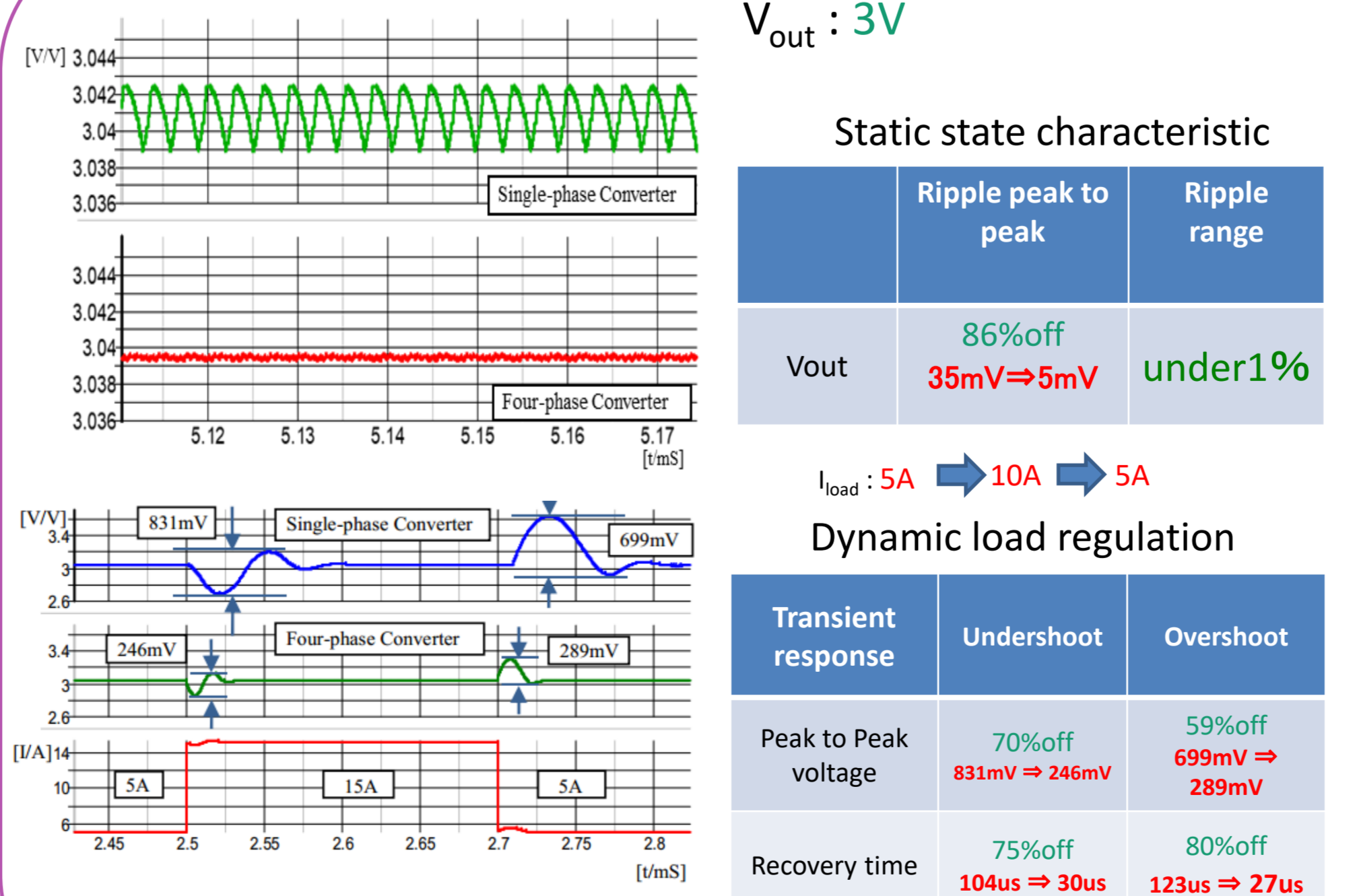


## Results and Discussion

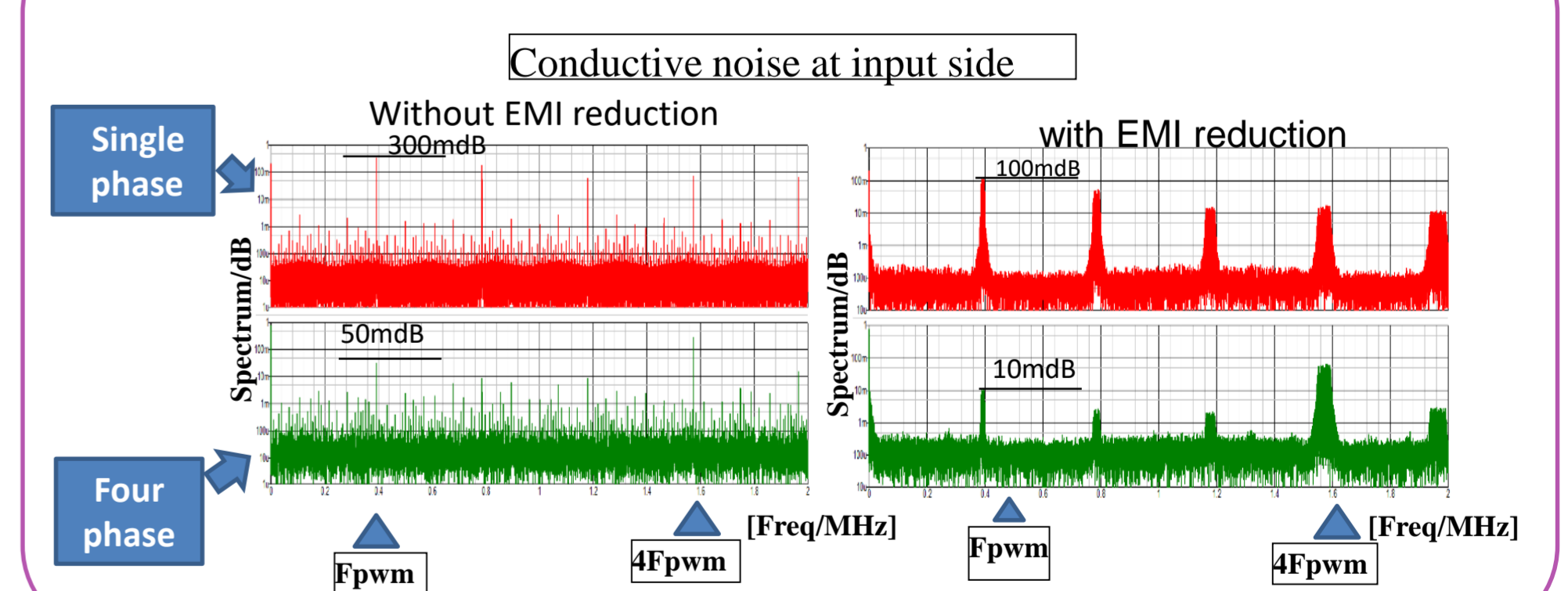
### Current Balance



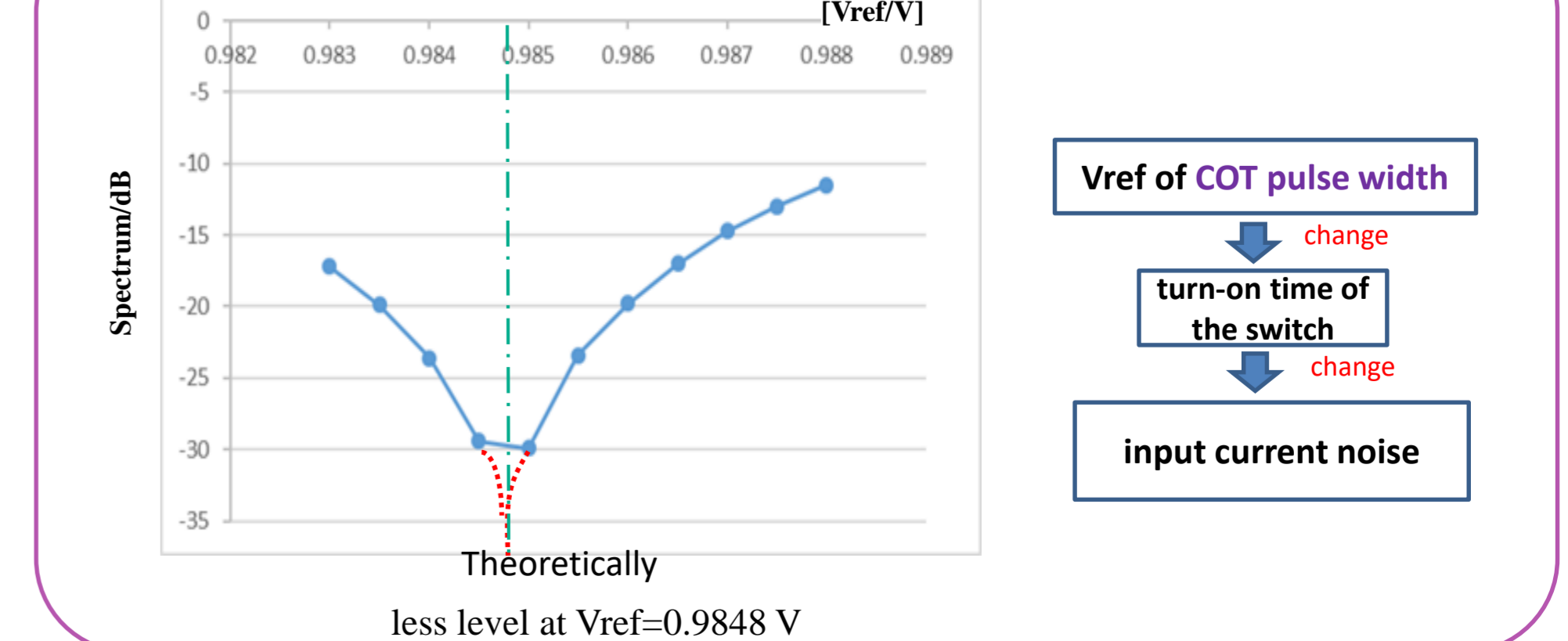
### Single and multi-phase Comparison



### Spectrum of Conductive Noise



### Conductive Noise and Vref



## Conclusion

- Design of good relationship between conductive noise and reference voltage for COT pulse is proposed
- Four-phase ripple controlled converter with EMI reduction is proposed
- Peak level of spectrum at  $4f_{pwm}$  is reduced
- Low output voltage ripple, Fast response
- Current balance is very good even at large output current